

Received: 8 June 2022 Accepted: 12 July 2022

DOI: <https://doi.org/10.33182/joe.v2i1.2391>



Book Review

Clarke, Bruce (2020). **Gaian Systems: Lynn Margulis, Neocybernetics, and the End of the Anthropocene.** University of Minnesota Press. ISBN 978-1517909123

Noel Gough¹

Throughout the last decade, calls for a return to materiality have reverberated within the humanities and social sciences. Few, however, have noticed that this return has also entailed a return to fiction, as the new theoretical writings on matter regularly include elements of storytelling, fabulation or other genres of invention. (Tobias Skiveren, 2020, p. 187)

As one of the “few” scholars who has not only “noticed” but also welcomed and performed a “return to fiction” in my own “theoretical writings on matter” (see, e.g. Noel Gough, 2021; Noel Gough & Chessa Adsit-Morris, 2020), I welcome Skiveren’s focus on the apparent alliance between new materialism and fiction and his questions about why “scholars united by a common interest in ‘getting real’ utilize a type of discourse defined precisely by not committing itself to reality?” Skiveren asks “why this alliance between new materialism and fiction has come about: Why do scholars united by a common interest in ‘getting real’ consistently utilize a type of discourse defined precisely by not committing itself to reality?”

Before suggesting several cogent (and in my judgment perfectly satisfactory) answers to his questions, Skiveren offers several examples of new materialist scholars who employ fictional modes of writing in their approaches to reconceptualising matter. Specifically, he draws attention to:

- Jane Bennett’s (2010, 2017, 2020) evocations of Franz Kafka’s fantastic stories, Walt Whitman’s poetry, and Henry David Thoreau’s nature writing;
- Stacy Alaimo’s (2010, 2016) engagement with literary works on contemporary environmental issues; and
- Donna Haraway’s (2016) demonstration of new ways of fabulating futures of sympoetic and multi-species companionship.

I can now add Bruce Clarke’s work to Skiveren’s examples, which includes not only the book reviewed here but also his shorter essays (e.g., Clarke 2017, 2020b). In fact, I was initially

¹ Noel Gough, La Trobe University, Melbourne, Australia. E-mail: N.Gough@latrobe.edu.au



motivated to explore Clarke's work by Steven Shaviro's (2021) review of Sherryl Vint's (2020) edited collection, *After the Human*, in *Science Fiction Studies*. Shaviro (2021, p. 567) writes:

Bruce Clarke's account of "Machines, AIs, Cyborgs, Systems" ... gives an overview of how the technological development of "thinking machines," and the concomitant theorizations of cybernetics and systems theory, have spurred the existence of a "posthuman imaginary." Clarke traces the development of this imaginary through cultural fantasies such as transhumanist visions of omnipotence on the one hand, and dystopian horror stories of robot takeovers on the other. This involves both pop-technology treatises such as those of Ray Kurzweil, and the denser and more nuanced reflections of sf creators, such as, most notably, Kim Stanley Robinson's novel *Aurora* (2017). Clarke's chapter was noteworthy...for the way it takes science-fictional speculation seriously alongside the more discursive writings of cyberneticists and scientists.

Shaviro's assertion that Clarke "takes science-fictional speculation seriously" (a standpoint that I enthusiastically share) piqued my curiosity about the ways in which Clarke enacts this disposition and motivated me to undertake this review. I am pleased to find that Clarke not only "takes science-fictional speculation seriously", but also, and judiciously, "takes science-fictional speculation" for granted by assuming (rather than condescending to) his readers' popular cultural literacy. For example, Clarke's (2017, p. 9) essay on several contemporary scholars' approaches to rethinking the Gaia concept invokes Isabelle Stengers' (2015 [2009]) reconceptualisation of Gaia by assuming readers' familiarity with a relatively recent (2009) "blockbuster" film:

The conceptual innovation in Stengers's discourse is to develop the figure of Gaia not in the mode of immanence – as, for instance, one finds depicted in Eywa, the Gaia figure in the planetary imaginary of James Cameron's *Avatar* – but in the mode of a kind of mundane transcendence... Stengers's Gaia is the name of an unprecedented or forgotten form of transcendence: a transcendence deprived of the noble qualities that would allow it to be invoked as an arbiter, guarantor, or resource; a ticklish assemblage of forces that are indifferent to our reasons and our projects.

In his introductory chapter to the book under review, Clarke (2020a, p. 1) recounts how, as a professor in a university department of English, he came to teach and conduct research at the intersections of literature and science:

...I found Gaia by way of chaos theory. In my part of academe, chaos theory arrived in 1987. By the 1990s, inspired partly by the avid interdisciplinary reception of this more technically denominated *dynamical systems theory*, I began... to cultivate a post-tenure specialization in literature and science. But as I set about to reschool myself in physics, chemistry, and biology, to come up to speed on chaos and complexity theory, thermodynamics and information theory, and then cybernetics and systems theories, where Gaia was concerned, not much came to hand. Even after it had crossed my threshold, ... I was reluctant to take it seriously. I had formed the nebulous impression that what "Gaia" named in scientific context was not quite real science but some kind of New Age notion connected to god knows what exactly. I took it to be the sort of idea that I, a recent interloper into the discourse of the sciences, in order to establish or maintain some minimal credibility, should avoid.



In chapter 1, Clarke (2020a, p. 23) explains how James Lovelock (1979a) came to be regarded as the “inventor who engineered the Gaia hypothesis”:

In “The Independent Practice of Science,” James Lovelock (1979b) describes his earlier professional milieu as a salaried researcher at the National Institute for Medical Research (NIMR) in London in 1961, prior to his emancipation as an independent scientist. It was then that NASA sent him “an invitation to be an experimenter on the first lunar Surveyor mission. It was well known at the NIMR that I regarded science as a way of life in which science fiction was reduced to practice.” In U.S. patent law, *reduction to practice* technically means to move an invention beyond the initial stage of conception to the testing and application of a prototype.

Collaborating with microbiologist and evolutionary theorist Lynn Margulis, Lovelock advanced the Gaia concept as applied systems science. Clarke (2020a, p. 23) interprets Lovelock’s Gaia discourse as “the speculative practice of a systems engineer steeped in the technological imaginary of cybernetics and information theory”. Lovelock (2019, p. 24) confirms Clarke’s interpretation in his most recent book, in which he admits that “I have never really been a pure scientist, I have been an engineer.”

Lovelock’s pre-Gaian activities include his invention of the electron-capture detector in 1958, which Clarke (2020a, p. 23-24) describes as “a device exquisitely sensitive to vanishing bits of atmospheric molecules, from industrial emissions to pesticide residues... Its ability to determine and distinguish natural and anthropogenic aerosols also coincided with early warning signs of the Anthropocene.” *Gaian Systems* explores anticipations of Gaia discourse in the biological sciences as well as its incubation within NASA’s projects for planetary exploration.

At the core of Part I’s chapters are Lovelock’s and Margulis’s technical and popular presentations of their scientific ideas. Chapter 1 reviews selections from the initial correspondence and first collaborative articles of Lovelock and Margulis on the Gaia hypothesis. Clarke (202a, p.15) rhetorically asks, “what’s in the name of Gaia?” to which he responds:

Seeming to broker relations between scientific and mythological ideas, that fateful name has surely brought about the unusually visible public face of the Gaia concept. Next, if Gaia is a system, what kind of a system is it? Lovelock and Margulis are consistent in their positioning of Gaia theory as an application of either first- or second-order cybernetic systems theory.

From these affirmations and exigencies Clarke extends his own systems-theoretical synthesis under the phrase “metabioc Gaia”.

Chapter 2 focuses on key issues of Gaia discourse in the critical humanities and social sciences, including Donna Haraway’s (1995) cyborg version of the autopoietic description of the Gaian system, which anticipates Stengers’ philosophical engagements with Gaia theory (see also Clarke 2017). Chapter 3 expands the exposition of neocybernetic systems theory within a short history of wider cybernetic thought.

Part II (“The Systems Counterculture”) traces the theoretical and historical strands that led to Margulis’s mode of Gaia discourse. Chapter 4 details the significant interactions of the Gaia

hypothesis with the network (in which I recall participating) established by the *Whole Earth Catalog*. Some of the earliest publications on the Gaia hypothesis appeared in this network, including Gerard K. O'Neill's (1978) proposals for space colonies in high orbit. As Clarke (2020a, p. 16) observes:

These images of environmental closure are significantly contemporaneous with the Gaia hypothesis. They translate its terrestrial implications into idealized technological vessels of dubious ecological merit but powerful emotional appeal. Channeled through these venues and issues, the Gaia concept will take on the aspect of a monumental project of thought crossing the lines of ecosystem ecology and cybernetic philosophy. The systems counterculture presented here as constituted by and documented within the Whole Earth network includes Whole Earth Catalog mastermind Stewart Brand, the cybernetic anthropologist Gregory Bateson and the polymathic systems thinker Francisco Varela.

Chapter 5 (“The Lindisfarne Connection”) examines a further permutation of the systems counterculture around Lovelock and Margulis in the Gaian connections of an intellectual gathering, the Lindisfarne Association, whose founder William Irwin Thompson, dedicated Lindisfarne to the pursuit of a planetary culture, invited Lovelock and Margulis to join discussions which formed the basis for his (1987, 1991) edited volumes that approached Gaia discourse from a largely neocybernetic angle.

Chapter 6 (“Margulis and Autopoiesis”) examines Margulis’s discourse of *autopoietic Gaia* in writings from the mid-1980s that reflected her exposure to neocybernetics. Clarke (2020a, p. 17) notes that “[f]or Margulis, an expanded conception of autopoiesis was to be the philosophical antidote for what she diagnosed as ‘big trouble in biology.’ Challenging the leading evolutionary narratives at that moment, this irruption of autopoietic Gaia theory incubated in the lab of the systems counterculture was not well understood and not always well received”.

Part III (“Gaian Inquiries”) begins by inquiring into the new planetary imaginary crystallized by NASA imagery of the Earth viewed from space. Some of the examples to which Clarke (2020a, p. 18) refers—including Frank Herbert’s (1965) science fiction novel *Dune* and Gregory Bateson’s (1972) *Steps to an Ecology of Mind*—“are items of Gaia discourse after the fact. These texts transmit the cultural moment of Gaia’s evolution in the 1960s at the intersection of cybernetics and ecology. They made significant contributions to the broader planetary imaginary in which the early Gaia concept also participated”. Other examples to which Clarke (2020a, p. 18) refers, including O’Neill’s (1978) *The High Frontier* and the literary uptake of such materially closed artificial ecologies as depicted in William Gibson’s (1984) novel *Neuromancer* are contemporaneous with the development of the Gaia hypothesis.

In the remainder of the book Clarke relates metabiotic Gaia discourse to current issues in neighboring theoretical conversations, including biopolitics, immunity, symbiosis, Astrobiology, and the Anthropocene. Chapter 8 begins with questions about Gaia’s boundaries (which go back to its first formulations in Lovelock’s earliest thermodynamic descriptions) and continues with questions about how Gaia theory stands in relation to the discourse of biopolitics.



Chapter 9 (“Astrobiology and the Anthropocene”) concludes *Gaian Systems* by asking what the cultural reading of the Anthropocene lacks that contemporary Gaia discourse might supply. Concurrent with the onset of Anthropocene discourse is a new profile for contemporary astrobiology with its debts to Lovelock and Margulis for its conceptual roots. Clarke (2020a, pp. 18-19) asks:

What happens if we put Gaia and the Anthropocene into a shared astrobiological context? These planetary formations now unfold against larger cosmological development including the origin of life and the destination of intelligence. As a domain of NASA science, astrobiology also studies materially closed artificial environments in the context of space exploration and habitation. Were we to leave our home planet for extended periods, would it be possible to take Gaia with us?

Clarke (2020a, p. 19) offers Kim Stanley Robinson’s (2015) science fiction novel *Aurora* as a profound meditation on these issues, as systems operations and dysfunctions on the journey of a generation starship toward another sun parallel current ecological imbalances produced by the Anthropocene technosphere (Clarke discusses the implications of Robinson’s science-fictional speculation in *Aurora* in great detail in Chapter 9). Clarke (2020a, p. 19) summarises the conclusion of *Gaian Systems* as follows:

The contemporary technosphere comes forward in a selection of its recent discourses ranging from the geological to the geopolitical and the astrobiological. For some thinkers, Gaia seems to be ready for an Anthropocene makeover with a smart technosphere taking up the biosphere’s controls. To me, that outcome seems unlikely—control theory for an unsteerable system. Even more problematic, in the end, is the vision of Gaia in Lovelock’s (2019) most recent book, *Novacene: The Coming Age of Hyperintelligence*. Several decades earlier, Margulis also addressed the place of technology in relation to Gaia, and a comparison of their approaches offers a concluding contrast between the informatic and the autopoietic sensibilities.

Clarke (2020a, p. 273) concludes *Gaian Systems* on a cautionary note: “Even when read as parable rather than prediction, Lovelock’s *Novacene* captures just how precariously we are now balanced between bygone and forthcoming biospheres”.

References

- Alaimo, Stacy. (2010). *Bodily Natures: Science, Environment and the Material Self*. Bloomington: Indiana University Press.
- Alaimo, Stacy. (2016). *Exposed: Environmental Politics and Pleasures in Posthuman Times*. Minneapolis, MN: University of Minnesota Press.
- Bateson, Gregory. (1972). *Steps to an Ecology of Mind*. New York, NY: Ballantine.
- Bennett, Jane. (2010). *Vibrant Matter: A Political Ecology of Things*. Durham, NC: Duke University Press.
- Bennett, Jane. (2017). Vegetal life and onto-sympathy. In Catherine Keller & Mary-Jane Rubenstein (Eds.), *Entangled Worlds: Religion, Science, and New Materialisms* (pp. 89-110). New York, NY: Fordham University Press.
- Bennett, Jane. (2020). *Influx and Efflux: Writing Up with Walt Whitman*. Durham, NC: Duke University Press.
- Clarke, Bruce. (2017). Rethinking Gaia: Stengers, Latour, Margulis. *Theory, Culture & Society*, 34(4), 3-26. <https://doi.org/10.1177/0263276416686844>
- Clarke, Bruce. (2020a). *Gaian Systems: Lynn Margulis, Neocybernetics, and the End of the Anthropocene*. Minneapolis: University of Minnesota Press.

- Clarke, Bruce. (2020b). Machines, AIs, cyborgs, systems. In Sherryl Vint (Ed.), *After the Human: Culture, Theory and Criticism in the 21st Century* (pp. 91-104). Cambridge: Cambridge University Press. <https://www.cambridge.org/core/books/after-the-human/machines-ais-cyborgs-systems/6CDBFD7E75E284E355F7650830F58C94>
- Gibson, William. (1984). *Neuromancer*. New York: Ace.
- Gough, Noel. (2021). Science fiction as a basis for global curriculum visions. In Ming Fang He & William H. Schubert (Eds.), *Oxford Encyclopedia of Curriculum Studies*. New York, NY: Oxford University Press. <https://doi.org/10.1093/acrefore/9780190264093.013.1125>
- Gough, Noel, & Adsit-Morris, Chessa. (2020). Words (are) matter: Generating material-semiotic lines of flight in environmental education research assemblages (with a little help from SF). *Environmental Education Research*, 26(9-10), 1491-1508. <https://doi.org/10.1080/13504622.2019.1663793>
- Haraway, Donna J. (2016). *Staying with the Trouble: Making Kin in the Chthulucene*. Durham, NC & London, UK: Duke University Press. <https://doi.org/10.1215/9780822373780>
- Haraway, Donna J.. (1995). Cyborgs and symbionts: Living Together in the New World Order" [Foreword]. In Chris Hables Gray (Ed.), *The Cyborg Handbook* (pp. xi-xx). New York/London: Routledge.
- Herbert, Frank. (1965). *Dune*. London: Victor Gollancz.
- Lovelock, James E. (1979a). *Gaia: A New Look at Life on Earth*: Oxford University Press.
- Lovelock, James E. (1979b). The independent practice of science. *New Scientists*, 83(1171), 714-717.
- Lovelock, James E. (2019). *Novacene: The Coming Age of Hyperintelligence*. Cambridge, MA: With Brian Appleyard. MIT Press. .
- O'Neill, Gerard K (1978). *The High Frontier: Human Colonies in Space*.
- Robinson, Kim Stanley. (2015). *Aurora*. London, UK: Orbit.
- Shaviro, Steven. (2021). Unable to be Born. [After the Human: Culture, Theory and Criticism in the 21st Century, Sherryl Vint]. *Science Fiction Studies*, 48(3), 565-565. <https://www.jstor.org/stable/10.5621/sciefictstud.48.3.0565>
- Skiveren, Tobias. (2020). Fictionality in new materialism: (Re)inventing matter. *Theory, Culture & Society*, 39(3), 187-202. <https://doi.org/10.1177/0263276420967408>
- Stengers, Isabelle. (2015 [2009]). In *Catastrophic Times: Resisting the Coming Barbarism* (Andrew Goffey, Trans.). Ann Arbor, MI: Open Humanities Press.
- Thompson, William Irwin (Ed.). (1987). *Gaia: A Way of Knowing—Political Implications of the New Biology*. Great Barrington, MA: Lindisfarne Press.
- Thompson, William Irwin (Ed.). (1991). *Gaia 2: A Emergence—The New Science of Becoming*. Hudson, NY: Lindisfarne Press.
- Vint, Sherryl (Ed.). (2020). *After the Human: Culture, Theory and Criticism in the 21st Century*. Cambridge, UK: Cambridge University Press.

